

CENTERS OF EXCELLENCE PROGRAM  
QUARTERLY REPORT  
DECEMBER 1987, JANUARY FEBRUARY 1988

Lynn H. Blake, Ph.D.  
1 April 1988

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NEW COMPANIES CREATED FROM CENTERS SINCE BEGINNING OF CONTRACTS:

Baron Medical  
Salt Lake City, Utah  
President: Dr. Young Kwon  
Product: Medical Devices  
Start-up date: 1 June 1987  
# of Employees: 12

Bioprocess Systems  
Salt Lake City, Utah  
President: Dr. U.R. Shettigar  
Product: Disposable blood  
filters  
Start-up date: 10 July 1987  
# of Employees: 3

Cardiac Research  
Salt Lake City, Utah  
President: James McCrae  
Product: Artificial Heart  
Valves  
# of Employees: 5

Smartware  
Provo, Utah  
President: Todd Moon  
Product: Controllers for  
Computers  
# of Employees: 5

CAM Software Inc.  
Provo, Utah  
President: Howard Millett  
Product: software  
# of Employees: 7

CIM Training Center (CTC)  
Provo, Utah  
President: Larry Shumway  
Product: Manufacturing modules  
# of Employees: 5

Digital Hearing Inc.  
Salt Lake City, Utah  
President: Dr. John Harrison  
Product: Artificial Ear  
# of Employees:

IBC Advanced Technologies  
Provo, Utah  
President:  
Product: Chemicals  
# of Employees: 1

Bonneville Microelectronics  
Salt Lake City, Utah  
President: Kent Smith  
Products:  
# of Employees: 2

Relocated Company:

Intraspace  
North Salt Lake, Utah  
President: Robert D'Ausilio  
Product: Satellites  
# of Employees: 500 (projected)

# SUMMARY

## CONTRACT AMOUNTS

### Planning Grants:

1.	Center for Biotechnology.....	\$ 10,000
2.	Center for Water Information Science and Control.....	10,000
3.	Center for Advanced Fossil Fuel.....	15,000
4.	Center for Advanced X-Ray.....	7,500
5.	Center for Communications Research.....	10,000
6.	Center for Microelectronics.....	10,000
7.	Center for Non-Intrusive Diagnostic X-Ray.....	7,500
8.	Center for Developing Heavy Oils to Asphalt.....	10,000

### Center Contracts:

1.	Center for Biopolymers at Interfaces.....	150,000
2.	Center for Controlled Chemical Delivery.....	246,000
3.	Center for Engineering Design.....	300,000
4.	Center for Advanced Combustion Engineering .....	500,000
5.	Center for Computer Integrated Manufacturing.(sub-contract)	
6.	Center for Advanced Supercritical Fluid Separation..	276,440
7.	Center for Signal Processing Systems.....	250,000
8.	Center for Computer Aided Design and Manufacturing..	450,000
9.	Center for Space Engineering Research.....	450,000
10.	Center for Artificial Hearts & Biomedical Devices...	125,000
11.	Laser Institute.....	100,000
12.	Center for Sensor Technology.....	75,000
13.	Center for Aerospace Science Technology.....(sub-contract)	
	Center for Aerospace Science Technology.....	175,000
14.	Center for Biotechnology.....	500,000
15.	Center for Communications.....	215,120
16.	Center for Microelectronics.....	244,080
17.	Center for Computer-based Education.....	180,000
18.	Center for Chemical Separations.....	200,000
19.	Center for Computer Information Networks Research...	100,000
20.	Center for X-Ray Imaging.....	90,000
21.	Center for Advanced Coal Technology.....	150,000
22.	Center Materials and Manufacturing.....	180,700
23.	Center for Base Technical Education.....	85,000
24.	Utah Research Institute.....	300,000

TOTAL \$ 5,422,340

SUMMARY  
MATCHING FUNDS

1.	Center for Biopolymers at Interfaces.....	\$ 437,980
2.	Center for Controlled Chemical Delivery.....	6,689,618
3.	Center for Engineering Design.....	6,441,700
4.	Center for Advanced Combustion Engineering ...	15,303,026
5.	Center for Computer Integrated Manufacturing.....	351,155
6.	Center for Advanced Supercritical Fluid Separation.....	1,664,392
7.	Center for Signal Processing Systems.....	2,134,475
8.	Center for Computer Aided Design and Manufacturing.....	4,391,959
9.	Center for Space Engineering Research.....	42,791,653
10.	Center for Artificial Hearts & Biomedical Devices.....	8,641,943
11.	Laser Institute.....	6,683,000
12.	Center for Sensor Technology.....	1,206,075
13.	Center for Aerospace Science Technology.....	767,683
14.	Center for Biotechnology.....	327,323
15.	Center for Communications.....	250,000
16.	Center for Microelectronics.....	7,864,986
17.	Center for Computer-based Education.....	905,904
18.	Center for Chemical Separations.....	493,706
19.	Center for Computer Information Networks Research.....	513,707
20.	Center for X-Ray Imaging.....	251,268
21.	Center for Advanced Coal Technology.....	789,832
22.	Center Materials and Manufacturing.....	241,254
23.	Center for Base Technical Education.....	160,807
24.	Utah Research Intitute.....	159,000

TOTAL           \$ 109,462,446

ACTUAL DOLLARS PAID TO CENTERS

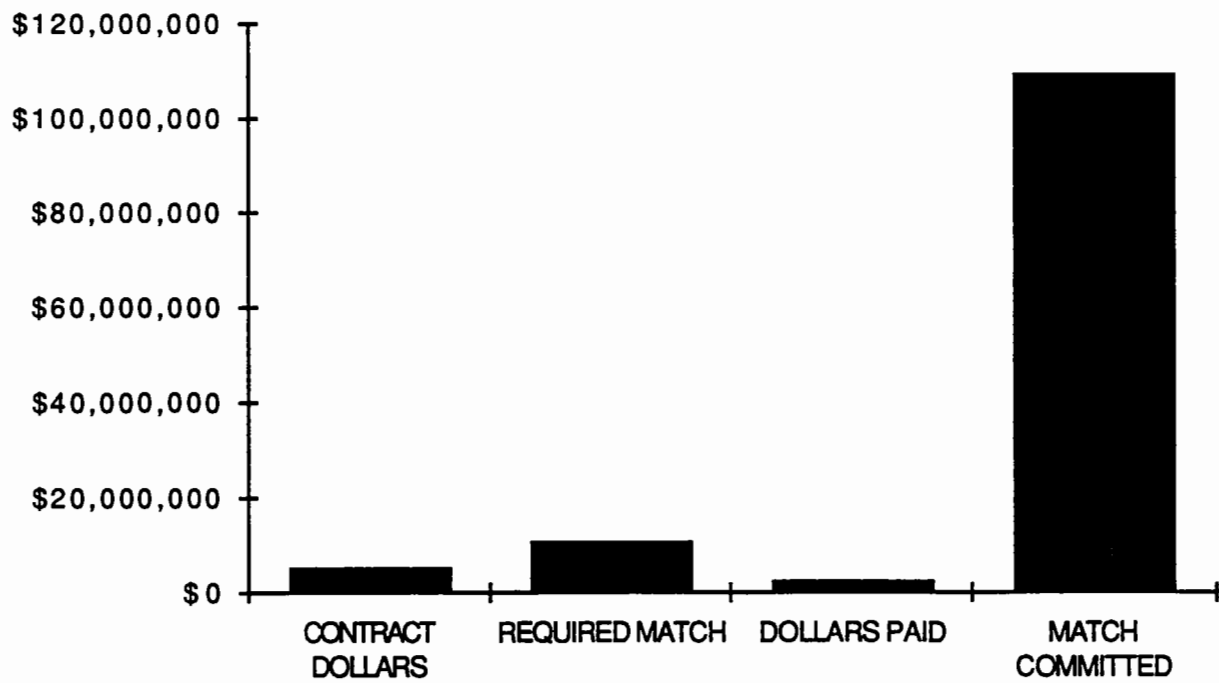
Planning Grants.....	\$ 80,000
Center Contracts.....	2,305,645

TOTAL PAYMENTS MADE BY COEP \$ 2,385,645

Match Dollars to Dollars Paid: 41 to 1

Newly associated Companies and Agencies: 191

**CENTERS OF EXCELLENCE PROGRAM  
APRIL 1988**





CENTER FOR BIOPOLYMERS AT INTERFACES      CONTRACT AMOUNT: \$75,000  
Karin D. Caldwell, University of Utah

The main focus is to develop a thorough understanding of interfacial interactions essential for the control of processes and the design of products in many areas of industry including food processing, medical devices, scientific instruments, pharmaceuticals, cosmetics, soaps and detergents, sensors and controls, coatings, and many areas of biotechnology.

<u>Matching Funds</u>	<u>In-Kind</u>	<u>Cash</u>
<u>Source</u>		
Bausch & Lomb		\$ 45,000
Becton-Dickinson		45,000
Ciba-Geigy		45,000
DuPont Biomed		45,000
Eastman Kodak		45,000
Eli Lilly		45,000
Johnson & Johnson		45,000
Proctor & Gamble		45,000
Travenol		45,000
Allergan Optical		45,000
Industry Fellowship Grants		22,500
NIH 1R 23A I22898-01		46,480
	<b>TOTAL</b>	<b>\$ 437,980</b>

Companies Associated Since Contract (9)

Allergan Optical  
Bausch & Lomb  
Becton-Dickinson  
Ciba-Geigy Corp.  
DuPont Biomedical Products  
Eastman Kodak Co.  
Eli Lilly & Co.  
Proctor & Gamble  
Travenol Laboratories

In-State Associations:  
Symbion, Inc.

Out-of-State Associations:

Allergan Optical  
Bausch & Lomb  
Becton-Dickinson  
Ciba-Geigy Corp.  
DuPont Biomed Products  
Eastman Kodak Co.  
Eli Lilly & Co.  
Johnson & Johnson  
Proctor & Gamble Co.  
Travenol Laboratories

Biopolymers at Interfaces Contract # 87-0352

Payments:	Amount	Balance
27 Feb 87	\$ 15,000	\$70,000
27 Feb 87	5,000	55,000
07 Dec 87	5,000	50,000
07 Dec 87	5,000	45,000
16 Feb 88	5,000	40,000

Total Payments: \$35,000

CENTER FOR CONTROLLED CHEMICAL DELIVERY      CONTRACT AMOUNT: \$100.000

Sung Wan Kim, University of Utah

The main focus is to develop new and effective methods for the delivery of pharmaceutical and chemical agents.

<u>Matching Funds</u> <u>Source</u>	<u>In-Kind</u>	<u>Cash</u>
Theratech Inc.		\$ 600,000
Theratech Inc.		900,000
Ciba-Geigy		1,200,000
Hisamitsu		15,000
Sam Yang Company		10,000
NIH (S.W. Kim)		1,744,204
NIH (J. Kopecek)		424,830
NIH (W.I. Higuchi)		940,000
NIH (K. Knutson)		855,584
	<b>TOTAL:</b>	<b>\$6,689,618</b>

Companies Associated Since Contract (5)

Theratech Inc.  
Research Medical Inc.  
Ciba-Geigy  
Baron Technologies  
Pfiser

In-State Industrial Associations:

Biomaterials International Inc.  
Therapeutics Technologies Inc.  
Theratech Inc.  
Research Medical Inc.

Out-of-State Associations:

Ciba-Geigy  
Pfiser  
Hisamitsu  
Sam Yang Co.

Controlled Chemical Delivery Contract #87-0352

<u>Payments:</u>	<u>Amount</u>	<u>Balance</u>
27 Feb 87	\$ 20,001	\$ 225,999
25 Mar 87	6,667	219,332
20 Jun 87	6,667	212,665
26 Oct 87	6,667	205,998
02 Feb 88	6,667	199,331

Total Payments: \$46,669

CENTER FOR ENGINEERING DESIGN      CONTRACT AMOUNT: \$300.000  
Stephen C. Jacobsen, University of Utah

The main focus is on projects including artificial limbs, drug delivery systems, physiological signal monitors, artificial kidneys, robots and microelectro-mechanical systems.

<u>Matching Funds</u>	<u>In-Kind</u>	<u>Cash</u>
<u>Source</u>		
DARPA		\$ 5,000.000
Sarcos		290,000
Sarcos		93,700
System Development Foundation		66,000
Ciba Giegy		400,000
Sarcos		430,000
NCI		162,000
	<b>TOTAL</b>	<b>\$ 6,441,700</b>

Companies Associated Since Contract (12)

Walt Disney Imagineering  
 Sarcos  
 Motion Control  
 JMW Acquisitions  
 Bell Laboratories  
 NASA  
 Wright Patterson Air Force Base  
 New York University  
 Merck  
 Rockwell  
 System Development Foundation  
 Winco

In-State Industrial Associations:

Animate Systems Inc.  
 Darpa  
 MFD (Microfield Devices)  
 Motion Control Inc.  
 Sarcos Inc.

Out-of-State Associations:

Walt Disney Imagineering  
 JMW Acquisitions  
 Bell Laboratories  
 NASA  
 Wright Patterson Air Force Base  
 New York University  
 Merck  
 Rockwell  
 System Development Foundation  
 Winco

Center for Engineering Design Contract #87-0435

Payments	Amount	Balance
18 Dec 86	\$ 28,571.42	\$ 271,428.58
29 Sep 87	28,571.42	242,857.15
29 Sep 87	28,571.42	214,285.72
29 Sep 87	28,571.42	185,714.29
29 Oct 87	28,571.43	157,142.86
29 Oct 87	28,571.43	128,571.43
02 Feb 88	128,571.43	-0-

Total Payments: \$300,000

CENTER FOR ADVANCED COMBUSTION      CONTRACT AMOUNT: \$500,000  
ENGINEERING RESEARCH

L. Douglas Smoot, Brigham Young University

The main focus is on development of new combustion technology that will improve the U.S. competitive position in the international market, with an emphasis toward the clean and efficient use of low-grade fossil fuels, particularly coal.

<u>Matching Funds:</u>	<u>In-Kind</u>	<u>Cash</u>
<u>Source</u>		
Advanced Fuel Research Inc.		\$ 2,000,000
Air Force		150,000
Angus Chemical		30,435
Babcock and Wilcox		49,678
Chevron Research		25,000
Combustion Engineering Inc.		65,000
Consolidation Coal		65,000
Convex Computer Corp.		75,000
Coordinating Research Council		40,000
Corning Glass Works		25,000
Dow Chemical USA		25,000
Electric Power Research Institute		132,429
Empire State Electric Energy		331,040
EPA		274,314
Foster Wheeler Corporation		49,678
Gas Research Institute		75,000
Gas Research Institute (2nd Contract)		238,150
General Electric Corporation		25,000
General Motors Corporation		25,000
Idaho National Engineering Lab		25,000
Los Alamos National Laboratory		62,294
Morgantown Energy Technology Center		1,041,432
National Institute of Health		127,186
National Science Foundation		9,700,000
National Science Foundation (Grant #2)		77,219
Pittsburgh Energy Technology Center		165,537
Pratt & Whitney		23,503
Pyropower Corporation		25,000
Questar Corporation		25,000
Shell Development		25,000
Southern California Edison Co.		25,000
Tennessee Valley Authority		82,769
TRW		25,000
Utah Power & Light		172,362
	TOTAL	\$15,303,026

Companies Associated Since Contract (14)

Convex Computer Corporation  
Gas Research Institute  
General Electric Corporation

Chevron Research  
Corning Glass Works  
Dow Chemical USA  
Idaho National Engineering Lab  
General Motors Corp.  
Pyropower Corp.  
Questar Corp.  
Shell Development  
Southern California Edison  
TRW Inc.  
Los Alamos National Laboratory

In-State Industrial Associations:

Combustion Lab  
Eyring Research Institute  
Hercules Inc.  
Questar Development  
Utah Power & Light

Out-of-State Associations:

Advanced Fuel Research Inc.  
Allison Gas Turbine  
ANL  
Babcock and Wilcox  
Battelle Memorial Institute  
Bertin and Cie (France)  
British Gas Corporation  
Chevron Research Co.  
Coen Company  
Combustion Engineering Inc.  
Conoco Coal & Chemicals Co.  
Convex Computer Corp.  
Corning Glass Works  
DOE/MEIC  
DOE/PETC  
Dow Chemical USA  
Electric Power Research Institute  
Empire State Electric Energy  
Energiteknisk Utveckling (Sweden)  
EPRI  
EVI  
Exxon  
Eyring Research Institute  
Foster Wheeler Corporation  
Gas Research Institute  
General Electric Co.  
Harwell  
Hercules  
Hitachi America Ltd.  
IHI Heavy Industries  
IRSID  
Kaiser Coal Corporation

Kobe Steel (Japan)  
 Laboratoires du Cherchar (France)  
 LANL  
 Los Alamos National Laboratory  
 MIT  
 Mt. Energy Resources  
 Morgantown Energy Technology Center  
 NASA  
 NRRI  
 Nuclear Technical Services  
 Phillips Petroleum Co.  
 Pittsburgh Energy Technology Center  
 Questar Development Corp.  
 Research Institute (Sweden)  
 Rockwell International  
 Sandia National Laboratories  
 Shell Development  
 Southern California Edison Company  
 Standard Oil  
 Tennessee Valley Authority  
 Utah Power & Light  
 Wayne State University

Center for Advanced Combustion Research Contract #87-0350

<u>Payments:</u>	<u>Amount</u>	<u>Balance</u>
01 May 86	\$500,000	-0-

Total Payments: \$500,000



CENTER FOR COMPUTER INTEGRATED (Sub-Contract From USU in  
MANUFACTURING the amount of \$132,000)  
 Dell K. Allen, Brigham Young University

The main focus is on development and application of software, hardware, and courseware, required for manufacturing systems integration; including software for variant and generative process planning, knowledge-based systems, electronic component selection and a shop-floor data collection system.

<u>Matching Funds:</u>	<u>In-kind</u>	<u>Cash</u>
<u>Source</u>		
Hewlett Packard		15,000
DCLASS Software Royalties		9,600
Avco Lycoming		125,555
Avco Lycoming		40,000
Autodesk	\$1,000	
Textron Lycoming		160,000
	Subtotals	\$1,000 \$350,155
	TOTAL	\$351,155

Companies Associated Since Contract (8)

Berrett Consulting  
 Infoquest  
 Visher  
 Hewlett Packard  
 Avco Lycoming  
 Reliance Electric  
 Autodesk Inc.  
 Textron Lycoming

In-State Industrial Associations:

Berrett Consulting  
 Boeing  
 Cam Software Inc. \*  
 Caterpillar  
 Cessna Aircraft  
 Clark Equipment  
 CTC\*  
 Digital and Management Technologies Inc.  
 EchoSystems  
 E-Soft  
 Evans & Sutherland Corp.  
 Infoquest  
 Morton-Thiokol  
 MTI  
 Raytheon  
 Smartware\*  
 Tolman Engineering

UNISYS  
Valtek  
VidComp  
Visher  
Westinghouse  
Xerox Corporation

Out-of-State Associations:

Autodesk Inc.  
AVCO-Lycoming  
Stanley Vidmar  
Reliance Electric

Center for Computer Intrgrated Mfg. (contract paid by USU)

CENTER FOR ADVANCED SUPERCRITICAL      CONTRACT AMOUNT: 150,000  
FLUID SEPARATION TECHNOLOGIES  
Milton L. Lee, Brigham Young University

The main focus is on research in three main areas: capillary column supercritical fluid chromatography, supercritical fluid extraction and fractionation for analytical purposes, and determination of the thermodynamic properties of supercritical fluids.

<u>Matching Funds:</u>	<u>In-Kind</u>	<u>Cash</u>
<u>Source</u>		
DOE- Identify Genotoxic Components		443,906
DEO- Supersonic Jet Spectroscopy		174,986
DOE- Mass Spectrometry		279,000
Gas Research Institute		300,000
Coordinating Research Council		40,000
Dow Chemical		8,000
Exxon Educational Foundation		8,000
Shell Development Co.		20,000
DOE		133,000
Finnigan Corporation		5,439
Gas Research Institute		196,178
NSF Adv. Combustion Eng.		80,000
Monsanto		17,500
Harvard Medical School		10,000
	<b>TOTAL</b>	<b>\$1,664,392</b>

Companies Associated Since Contract (7)  
Shell Development Co.  
Dow Chemical  
Exxon Research & Engineering  
Monsanto  
Finnigan Corporation  
Monsanto  
Harvard Medical School

In-State Industrial Association:  
Chevron  
Lee Scientific  
Union Carbide

Out-of-State Associations:  
Gas Research Institute  
Dow Chemical  
Exxon Research & Engineering  
National Science Foundation  
Department of Energy  
Shell Development Co.  
Monsanto  
Harvard Medical School

Center for Advanced Supercritical Fluid Contract #87-2279

Payments:	Amount	Balance
01 Jun 87	\$ 10,928.48	\$ 139,071.52
01 Jun 87	7,781.99	131,289.53
22 Jun 87	10,114.58	121,174.95
23 Jul 87	29,083.46	92,091.49
07 Dec 87	19,145.25	72,946.25
01 Jun 87	10,612.82	62,333.43
Amendment/add	126,440.00	188,773.43
02 Feb 88	92,936.74	95,836.69

Total Payments: \$180,603.32

CENTER FOR SIGNAL PROCESSING      CONTRACT AMOUNT: \$250,000  
SYSTEMS

Douglas M. Cabries, Brigham Young University

The main focus is on five closely related research efforts: (1) VLSI research into the design and miniaturization of integrated circuit devices; (2) image processing research focused on compression techniques to allow video teleconferencing; (3) speech processing with adaptive technology which has focused on the elimination of noise and compensation for the hearing impaired; (4) robotics research focused on both visual and automatic speech recognition to be used with robots in a manufacturing environment; and (5) optimal estimation theory research applied to the needs of local industry.

<u>Matching Funds:</u>	<u>In-Kind</u>	<u>Cash</u>
<u>Source</u>		
Environmental Research		\$ 25,000
ESL		51,139
ESL		24,563
FBI		25,000
FBI		100,000
Hewlett Packard	\$ 680,000	
Hewlett Packard	453,000	
Hewlett Packard	381,434	
Hughes		54,000
Hughes		30,997
Hughes		50,000
ICON	25,000	
Netline		10,000
Office of Naval Research		39,942
Space Dynamics Lab		90,000
Tektronix	20,000	
Tektronix	19,400	
UNISYS		40,000
Westinghouse		90,000
— Subtotals	\$1,578,834	\$555,641
	TOTAL	\$2,134,475

Companies Associated Since Contract: (11)

Hewlett Packard  
Westinghouse  
UNISYS  
Tektronix  
Hughes  
Office of Naval Research  
Federal Bureau of Investigation  
Digital Hearing  
Antin

Excalibur  
FBI

In-State Industrial Associations:

Digital Hearing Inc.\*  
ESL (SLC)  
Eyring Research Institute  
Excalibur Electronics  
Gould/AMI Inc.  
Icon  
Signetics  
TRW ESL Utah Software Office  
UNISYS  
Westinghouse  
Wicat

Out-of-State Associations:

Hewlett Packard  
Tektronix  
Netline  
Antin/CAECO

Center for Signal Processing Contract #87-0523

Payments:	Amount	Balance
18 Dec 86	\$ 92,500	\$ 157,500
16 Jan 87	21,432	136,068
11 Sep 87	51,024	85,044
Amendment +	146,334	231,378
16 Feb 88	34,016	197,362

Total Payments: \$198,972

CENTER FOR COMPUTER AIDED DESIGN      CONTRACT AMOUNT: \$450,000  
& MANUFACTURING

Warren F. Phillips, Utah State University

The main focus is research in computerized drafting, 3-D design, solid modeling, finite element modeling, numerical controlled manufacturing, robotics, facilities management, plant monitoring and control, data base management and inventory planning.

<u>Matching Funds:</u>	<u>In-Kind</u>	<u>Cash</u>
<u>Source</u>		
Structural Dynamics Co.		\$ 252,000
Dassault Systems Co.		219,000
Lockheed Co.		123,000
Mac-Neal Schwendler		72,000
Morton-Thiokol		75,000
Control Data		6,000
NASA		168,310
Consulting by Consortium	\$ 42,717	
IBM		<u>3,433,932</u>
Subtotals	\$ 42,717	\$4,349,242
	TOTAL:	\$ 4,391,959

Companies Associated Since Contract (19)

Psomas & Associates  
Yampa Valley Coal Corp.  
ELC Electron Consulting Spa (Italy)  
Alca Engineers  
Pyramid Engineering  
B&A Engineering Inc.  
Raymond Vail & Associates  
Central Utah Water Conservancy District  
Jones & Associates  
Hercules Inc.  
Engineering Dept. of Bountiful, Utah  
Department of Natural Resources, Division of Water Resources  
Getty Mining Co.  
Weber Basin Water Conservation ..  
Emery Mining  
Caldwell Richards & Swensen  
Atascadero Mutual Water Co.  
W.E. Quicksall & Associates Inc.  
NASA

In-State Associations:

Autonetics Strategic Systems Division  
Caldwell Richards & Swensen  
Central Utah Water Conservancy District

Department of Natural Resources, Division of Water Resources  
Eimco Process Equipment Co.  
Emery Mining Corp.  
Evans & Sutherland  
Ford Bacon & Davis Engineers  
Fram Autolight  
Getty Mining Company  
Hercules Inc.  
Jones & Associates  
Morton-Thiokol Inc.  
Northwest Pipeline Corp.  
Omnidata International  
Rockwell International  
TRW Ballistic Missiles  
Utah Power & Light  
Weber Basin Water Conservancy

Out-of-State Associations:

Structural Dynamics Co.  
Dassault Systems Co.  
Lockheed Co.  
Mac-Neal Schwendler  
Atascadero Mutual Water Co.  
ELC-ELECTRONCONSULT  
W. E. Quicksall & Assoc.  
B. & A. Engineers, Inc.  
Fars Regional Authority  
Sierra Pacific Power Co.  
Gingery Engineering Co.  
UMA-Engineering Unlimited  
KKBNA Engineers, Inc.  
Howard Godat & Assoc., Inc.  
Marbury Engineering Co.  
Aktiengesellschaft  
Boeing Computer Services  
Oregon Institute of Technology  
USAID/EQUADOR  
City of Jacksonville, Fla.  
Board of Public Utilities of Casper Wyoming  
Office National de l'eau Potable in Morocco  
EMC Engineering Co.  
SAINCO  
Universai Engineering Co.  
Pyramid Engineers & Land Surveyors  
J-U-B Engineers, Inc.  
Center for Mgmt Utilities & Protection - Cookeville, TN  
TRACOR Applied Sciences, Inc.  
Forsgren-Perkins Engineering  
TRACOR Hydronautics Inc.  
West National Tech. Center - Portland, OR  
SYMCAS, Inc.  
Troltz King Durall Anderson & Assoc.



Costin Engineering Co.  
 FLOOD Engineers  
 Macolom-Pirnjie Consulting Engineers  
 Bohannon-Huston Inc.  
 Katholieke Univ. (Belgium)  
 Willdan Assoc.  
 ADEM Ingenieurs Consells (Belgium)  
 Eduardo Ribeiro de Souse (Portugal)  
 Roen Design Assoc.  
 Ford Engineering  
 CH2M-Hill  
 Wiley & Wilson  
 PRC Troups. Div. of PRC Engineering  
 AMAX Coal Co.  
 VTM Consolidated Inc.  
 FEMA  
 TUV  
 Goodyear Atomic Corp.  
 E. I. DuPont DeNemours & Co.  
 Robert C. Bogart & Assoc.  
 City of Lafayette, LA  
 PETRO Canada Exploration Inc.  
 Montgomery Engineers  
 CE-DATA A/S Byggeteknisk (Denmark)  
 UN PROYECTO CONACYT CIQA (Mexico)  
 Merrick & Co.  
 Holmes & Marver Inc.  
 Banner & Assoc.  
 East Bay Municipal Utility - Oakland, CA  
 Pacific Power & Light of Portland  
 Psomas & Associates  
 Yampa Valley Coal Corp.  
 ELC Electron Consult Spa  
 Alca Engineers  
 Pyramid Engineering  
 Raymond Vail & Associates

Center for Computer Aided Design and Manufacturing  
Contract #87-0441

Payments:	Amount	Balance
16 Jan 87	\$ 19,855.76	\$ 430,144.24
07 Dec 87	10,318.57	419,825.67
23 Jul 87	9,605.42	410,220.25
07 Dec 87	21,384.31	388,835.94
17 Feb 88	54,361.79	334,474.15

Total Payments: \$115,525.85

CENTER FOR SPACE ENGINEERING RESEARCH CONTRACT AMOUNT: \$725.000  
Frank J. Redd, Utah State University

The main focus is to bring University Space Engineering resources to bear on the support of locally based space enterprises, encourage innovative research leading to spinoffs of new industry, attract new space industry to Utah, and produce experienced graduates ready to join an expanding state employment base in space industries.

<u>Matching Funds:</u>	<u>In-kind</u>	<u>Cash</u>
<u>Source</u>		
Globesat Inc.		\$ 200.000
UNISYS		30.970
Space Systems Engineering		12.705
Morton-Thiokol		223.100
Learn Inc.		14.060
Fibertek		7.200
USAF/Spirit II		18,400,000
USAF/ARII		16,108,739
DNA/EXCEED		2,950.209
USAF/AFGL (056)		3,270.168
NASA/Space Exp. Design		300.000
USAF/CIRRIIS		1,229.534
NASA/Space Sys. Design		<u>44.958</u>
Total		42,791,653

Companies Associated Since Contract (9)

Globesat Inc.  
UNISYS  
Space Systems Engineering  
Morton-Thiokol  
Learn Inc.  
Fibertek  
Rockwell International  
Space Data Corporation  
McDonnell Douglas

In-State Industrial Associations:

Globesat  
Eyring Research Institute Inc.  
E-Systems Inc.  
Learn Inc.  
Morton-Thiokol  
Northwest Pipeline Corporation  
Space Systems Engineering  
UNISYS

Out-of-State Associations:

American Rocket Company  
Boeing Aerospace

Rockwell  
Space Data Corporation  
McDonnell Douglas

Center for Space Engineering Contract #87-0351

Payments:	Amount	Balance
16 Jan 87	\$ 16,335.92	\$ 458,664.08
01 Jan 87	32,651.59	426,012.49
23 Jul 87	82,268.57	343,743.92
23 Jul 87	52,093.32	291,650.60
10 Dec 87	149,329.02	142,321.52
21 Mar 88	41,107.04	101,214.48
Amendment +	250,000.00	351,214.48

Total Payments: \$373,785.46

CENTER FOR TOTAL ARTIFICAL HEARTS      CONTRACT AMOUNT: \$225,000  
& BIOMEDICAL DEVICES

Donald B. Olsen, University of Utah

The main focus is on the development of artificial organs such as the heart and monitoring and diagnostic devices, artificial fallopian tube, urinary bladder, urethra, sphincter and ureter.

Matching Funds:

<u>Source</u>	<u>In-Kind</u>	<u>Cash</u>
Symbion surgical training		888,287
Dr. Kwon (electromechanical heart)		70,000
NIH Immune Response		248,261
NIH Artificial Heart		5,000,000
NIH Grant - Small Art. Heart		1,089,457
NIH Grant - Arterial Peptide		600,000
NIH Grant - Utah 100		103,287
NIH Grant - UCLA		140,810
NIH Grant - LVAD		100,781
NIH Grant - Platelet		288,060
Temple University		50,000
Nimbus		30,000
Technical Research Assoc.		500
VA Hospital		25,000
Catheter Technologies		7,500
Symbion		328,378
Dr. Kwon		70,000
NIH		350,000
NIH		911,828
NIH		600,000
NIH		97,801
Nimbus		144,923
Desert Med.		5,000
VA Hospital		9,377
Murex		32,000
Total		\$8,641,943

Companies Associated Since Contract (4)

Cardac Systems  
Nimbus  
Technical Research Assoc.  
Catheter Technologies

In-State Associations:

Baron Technologies

Catheter Technology  
Deseret Pharmaceuticals  
Symbion

Out-of-State Associations:

Lexco  
Cardiac Systems\*

Center for Artificial Hearts Contract #87-0532

Payments:	Amount	Balance
26 Oct 87	\$ 41,667	\$ 83,333
26 Oct 87	8,334	74,999
02 Feb 88	8,334	66,665
New Contract:	\$ 100,00	\$ 166,665
Total Payments:	\$58,335	

LASER INSTITUTE

CONTRACT AMOUNT: \$ 100,000

John A. Dixon, University of Utah

The main focus is the development of cardiac surgical laser devices, drugs (photosensitizers), fluorescence sensors, laser fibers and laser power sources in the photodynamic therapy of cancer, and multiple wavelength treatment capabilities for laser surgery.

<u>Matching Funds:</u>	<u>In-Kind</u>	<u>Cash</u>
<u>Source</u>		
Phaser-R Corp.		35,000
Cooper LaserSonics		70,000
Treadwell Foundation		35,000
Virginia Zambukas Estate		43,000
Office of Naval Research - Lasers in Biomed.		1,200,000
Office of Naval Research - Lasers in High Energy		800,000
Strategic Defense Initiative Contract		4,500
	Total	\$6,683,000

Companies Associated Since Contract (12)

Pfizer Hospital Products  
Luxtron  
3M  
HGM Medical Lasers  
Cooper Lasersonics  
Xanar  
R. Wolfe  
Olympus Corp. of America  
SLI  
Lasers for Medicine  
Eder Instruments  
Treadwell Foundation

In-state Associations:

HGM Medical Laser Systems

Out-of-State Associations:

Pfizer  
Luxtron  
3-M Corp.  
Cooper Lasersonics  
Xanar  
R. Wolfe  
Olympus Corp. of America  
SLI  
Lasers for Medicine  
Eder Instruments  
Treadwell Foundation

Laser Institute Contract #87-0352

<u>Payments:</u>	<u>Amount</u>	<u>Balance</u>
27 Feb 87	\$ 20,000	\$80,000
27 Feb 87	6,667	73,333
29 Sep 87	6,667	66,666
26 Oct 87	6,667	59,999
2 Feb 88	6,667	53,332

Total Payments: \$46,668

CENTER FOR SENSOR TECHNOLOGY      CONTRACT AMOUNT: \$ 75,000  
Jiri Janata, University of Utah

The main focus is on integration of solid state electronics, chemistry, physics and biology and investigation and application of the physiological and biochemical principles of sensing.

<u>Matching Funds:</u>	<u>In-Kind</u>	<u>Cash</u>
<u>Source</u>		
NIH - Remote Monitoring of Proteins		\$ 281,016
Office of Naval Research		285,879
Whitaker Foundation		143,977
NIHR		195,203
Boehringer Mannheim (5 yr)		75,000
Ciba Corning (5 yr)		75,000
IC Sensors (5 yr)		75,000
Sorin Biomedica (5 yr)		75,000
Total		\$ 1,206,075

Companies Associated Since Contract (7)

Baxter Travel  
Boehringer Mannheim  
Ciba-Corning  
Eli Lilly  
I.C. Sensors  
Sorin Biomedica (Italy)  
Unilever

In-State Associations:  
Sorenson Research

Out-of-State Associations:  
National Institute of Health  
Office of Naval Research  
Whitaker Foundation  
NIHR  
Baxter Travel  
Boehringer Mannheim  
Ciba-Corning  
Eli Lilly  
I. C. Sensors  
Sorin Biomedica (Italy)  
Unilever



Center for Sensor Technology Contract #87-0352

<u>Payments:</u>	<u>Amount</u>	<u>Balance</u>
25 Mar 87	\$ 15,000	\$ 60,000
20 Jul 87	10,000	50,000
27 Oct 87	5,000	45,000

Total Payments: \$30,000

CENTER FOR AEROSPACE SCIENCE      CONTRACT AMOUNT: \$ 175,000

TECHNOLOGY

Robert J. Twiggs, Weber State College

The main focus is to design and manufacture useful aerospace experiments, devices or systems, and to support similar enterprises in space industries and in other Utah schools and organizations.

<u>Matching Funds:</u>	<u>InKind</u>	<u>Cash</u>
<u>Source</u>		
ADS, INC.	100	
Affiliated Metals	1,091	
Affiliated Metals	5,000	
American Cyanamid	100	
Browning Manufacturing		125
Bonneville Scientific		4,700
Deutsch Fastener Corp.	170	
Federal Aviation Assoc.		24,000
Federal Aviation Assoc.		800
Federal Aviation Assoc.		14,000
Hexel Corp.	500	
Hill Air Force Base (Vibration Facility)	27,000	
Lundahl Astro Circuits		3,500
Microtech Research Inc.	850	
Narmco Materials	100	
Neulink Inc.	68	
Peterson Specialized Fabricators	475	
Pensar Inc.		1,240
Spectro Labs	3,600	
Stanley Tools	75	
TRW	470	
Iomega		4,700
Richland Community College		3,000
Ogden City		15,000
Orchid Engineering		519
UTFC		12,000
Intraspace	25,000	
In-Kind hours (WSC & Companies)	<u>619,000</u>	
(this figure documented with a detailed breakdown on file)		
Subtotals	\$ 685,099	\$ 82,584
TOTAL		\$767,683

Companies Associated Since Contract (23)

Stanford Telecommunications Inc.

Intraspace

Orion International Technical

RMS Technical Inc.

Niagara Mohawk Power  
TRW  
Ballalis  
QSI Systems  
Federal Aviation Assoc.  
Computer Science Corp.  
Bonneville Scientific  
Eagle Canyon Research Assoc.  
Toomay Mathis & Associates  
Ogden City Development  
Richland Community College  
EGNGG  
Globesat  
Lundahl Astrocircuits  
Morton-Thiokol  
Rockwell International  
Pensar  
Browning Arms  
Orchid Engineering

In-State Industrial Associations:

Bonneville International Corp.  
Browning Manufacturing  
Computer Sciences Corp.  
Defense Systems Inc.  
Globesat  
Intraspace Inc.\*\*  
McDonald Douglas  
Morton-Thiokol Corp.  
Orchid Engineering  
QSI Systems  
Rockwell International Inc.  
TRW Aircraft Systems Group  
TSA Technologies  
Union Pacific  
UNISYS

Out-of-State Associations:

Intraspace Inc.  
Space Systems Inc.  
Orion  
RMS Technologies  
Niagra Mohawk  
Amateur Sat. Group  
Richland Comm. Coll. - Decatur  
Federal Aviation Assoc.  
Space Services Inc.

Center for Aerospace Science Technology Contract #88-1430

(No Payments to Date)

CENTER FOR BIOTECHNOLOGY

CONTRACT AMOUNT: \$200,000

Steven Aust, Utah State University

The main focus is development of recombinant DNA technology in plant breeding, use of microbiologicals in agriculture, use of monoclonal antibodies in disease control of livestock animals, and to enhance enzyme production for food processing and engineering control.

Matching Funds  
SourceIn-KindCash

NIH/HHS

24,405

EPA

140,000

University of Louisville

162,918

TOTAL

\$327,323

Companies Associated Since Contract (21)

Breakthrough

Utah Innovation Center

Hiltech

Spectrum Sciences &amp; Software, Inc.

City Development, Inc.

International Technology Corporation

Morrison-Knudsen Engineering

Arthur Young Intl.

Remediation Technologies Inc.

Uniroyal Chemical Co.

Hoechst Cleanese Corp.

ERM Southwest

ARI

American Cyanamid

General Dynamics, Convair Div.

Merrell Dow Research Institute

Proctor and Gamble Co.

Rutgerswerke

Penwalt Corp.

Shell Development

Utah Power and Light

In-State Associations

Breakthrough

Utah Innovation Center

Spectrum Sciences &amp; Software Inc.

City Development Inc.

Arthur Young International

Utah Power and Light

Out-of-State Associations

ERM Southwest

Remediation Technologies

Hiltech  
International Technology Corporation  
Morrison Knudsen Engineering Inc.  
Uniroyal Chemical Co.  
Hoechst Celanese Corp.  
ARI  
American Cyanamid  
General Dynamics  
Merrell Dow Research Institute  
Proctor and Gamble  
Rutgerswerke  
Penwalt Corp.  
Shell Development Corp.  
University of Louisville

Center for Biotechnology Contract #87-3118

(Payment of \$10,000 for Planning Grant Only - No payments on  
Contract to Date)

CENTER FOR COMMUNICATIONS                      CONTRACT AMOUNT: \$ 215.120  
Craig Rushforth, University of Utah

The main focus is on research on computer/communications networks, data compression, application of signal processing algorithms, coding, modulation and spread spectrum.

<u>Matching Funds:</u>	<u>In-Kind</u>	<u>Cash</u>
<u>Source</u>		
UNISYS		\$ 230.780
Public Health Service		<u>19,220</u>
	TOTAL:	\$250.000

Center for Communications Contract #87-2894

<u>Payments:</u>	<u>Amount</u>	<u>Balance</u>
26 Oct 87	\$16,450.00	\$108,550.00
Amendment +	90,120.00	198,670.00
2 Feb 88	9,868.41	188,801.59

Total Payments: \$116,438.41

CENTER FOR MICROELECTRONICS      CONTRACT AMOUNT: \$ 244,080  
Gerald B. Stringfellow, University of Utah

The main focus is to develop new material for semiconductor devices, new technology for processing of these new materials into useful devices and circuits, new integrated circuit design tools for existing silicon circuits and for the new devices.

<u>Matching Funds:</u>	<u>In-Kind</u>	<u>Cash</u>
<u>Source</u>		
Department of Energy		\$ 735,552
DARPA		5,003,496
UNISYS		277,000
American Cyanamid		77,682
NASA		70,000
General Instrument		500,000
National Science Foundation		214,531
ONR		162,922
ATM		19,177
ONR/NRL		451,008
	<b>TOTAL</b>	<b>\$ 7,864,995</b>

Companies Associated Since Contract (6)

General Instrument  
 Advanced Technology Materials  
 Purdue Fredrick Co.  
 NSF  
 ONR/NRL  
 Bonneville Microelectronics\*

In-State Associations

UNISYS  
 Bonneville Microelectronics

Out-of-State Associations

General Instrument  
 Advanced Technology Materials  
 Purdue Fredrick Co.  
 National Science Foundation  
 American Cynamid  
 DARPA

Center for Microelectronics Contract #87-2893

<u>Payments:</u>	<u>Amount</u>	<u>Balance</u>
04 Dec 87	\$32,116	\$211,964
16 Feb 88	19,269	192,695

Total Payments: \$51,385

CENTER FOR COMPUTER-BASED EDUCATION      CONTRACT AMOUNT: \$ 180,000  
Gordon Stokes. Brigham Young University

The main focus is on developing software for the delivery of instruction, development of authoring productivity tool that incorporate object-oriented design, data-base management, and graphics production facilities, and adaptive teaching systems.

<u>Matching Funds</u>	<u>In-Kind</u>	<u>Cash</u>
<u>Source</u>		
Digital Equipment Corp.		\$ 75,000
IBM		100,000
DOD		366,601
Sun Microsystems		42,300
Calico		192,220
National Security Agency		129,783
	<u>TOTAL</u>	<u>\$ 905,904</u>

Companies Associated Since Contract (8)

Digital Equipment Corp.  
IBM  
DOD  
Calico  
National Security Agency  
Sun Microsystems  
Defense Language  
Tandberg Research

In-State Associations

Calico  
WICAT

Out-of-State Associations

Digital Equipment Corp.  
IBM  
DOD  
National Security Agency  
Sun Microsystems  
Defense Language  
Tandberg Research

Center for Computer-based Education Contract #88-1352

<u>Payments:</u>	<u>Amount</u>	<u>Balance</u>
29 Oct 87	\$45,000	\$135,000

Total Payments: \$45,000



CENTER FOR CHEMICAL SEPARATIONS      CONTRACT AMOUNT: \$ 200,000  
Reed Izatt, Brigham Young University

The main focus is to design and construct pilot plants for three separation systems based on existing laboratory scale operations, reduction of the level of unwanted and toxic species from municipal and other water supplies, recovery of high value metals from waste solutions, and the design and construction of new disposable electrodes for the qualitative detection of selected elements.

<u>Matching Funds</u> <u>Source</u>	<u>In-Kind</u>	<u>Cash</u>
National Science Foundation		\$ 53,500
Department of Energy		100,000
Gas Processor Association		45,000
Electric Power Research Institute		138,099
American Chemical Society		17,500
Office of Naval Research		98,607
Serpentix		41,000
	TOTAL:	\$ 493,706

Companies Associated Since Contract (2)  
Serpentix  
IBCAT

In-State Associations  
IBCAT \*

Out-of-State Associations  
National Science Foundation  
Department of Energy  
Gas Processor Association  
Electric Power Research Institute  
American Chemical Society  
Office of Naval Research

Center for Chemical Separations Contract #88-1351

<u>Payments:</u>	<u>Amount</u>	<u>Balance</u>
29 Oct 87	\$ 50,000	\$ 150,000
21 Mar 88	50,000	100,000

Total Payments: \$100,000

CENTER FOR COMPUTER INFORMATION NETWORKS      CONTRACT AMOUNT: \$ 100.000

Bruce R. Peterson, Utah State University

The main focus is to develop comuter assisted methods for the design, analysis, and simulation of large computer information networks.

<u>Matching Funds:</u>	<u>In-Kind</u>	<u>Cash</u>
<u>Source</u>		
Drexel University		\$ 114.030
Drexel University		119.677
Bell of Pennsylvania		50.000
Apple Computer		50.000
Northern Telecom		50.000
Pennsylvania ATC-BFP		50.000
Novell Systems		50.000
UNISYS		<u>30.000</u>
	<u>TOTAL:</u>	<u>\$ 513.707</u>

Companies Associated Since Contract

In-State Associations

Novell  
UNISYS

Out-of-State Associations

Drexel University  
Bell of Pennsylvania  
Apple Computer  
Northern Telecom  
Pennsylvania ATC-BFP

Center for Computer Information Networks Research  
Contract #88-2413

(No Pauments to Date)

CENTER FOR X-RAY IMAGING

CONTRACT AMOUNT: \$90,000

Larry Knight, Brigham Young University

The main focus is to use X-Ray microlithography to achieve the small pattern dimensions necessary for the next generation of computer chips, as well as for improved medical imaging--both conventional and microscopic, for nondestructive testing of semiconductor chips, welds, etc., and for plasma diagnostics for nuclear fusion and underground tests.

Matching FundsIn-KindCashSource

L. Livermore National Lab  
(L Division)  
(Y Division)  
Dept. of Energy

98,321  
44,928  
107,340

TOTAL

\$ 251,268

Companies Associated Since Contract (4)

L. Livermore National Lab  
Moxtek  
Galtech  
Lee Scientific

In-State Associations

Moxtek  
Galtech  
Lee Scientific

Out-of-State Associations

L. Livermore National Lab

Center for X-Ray Imaging Contract #88-1353

Payments:	Amount	Balance
16 Feb 88	\$22,500	\$67,500

Total Payments: \$22,500

CENTER FOR ADVANCED COAL TECHNOLOGY      CONTRACT AMOUNT: \$150,000  
Larry Anderson, University of Utah

The main focus is the development of new markets for Utah coals, to promote processing, upgrading and preparation of Utah coals, and to promote efforts between institutions of the state and local industry in student and technician training for coal research. Also, to implement new technologies in coal/water slurry transport, differential liquefaction and resin extraction, and to find new markets for coals and their products.

<u>Matching Funds:</u>	<u>In-Kind</u>	<u>Cash</u>
<u>Source</u>		
DOE (Fossil Fuel Liquefaction)		\$ 115,000
BYU (NMR Studies: Solid Crystalline)		100,772
DOE (5-27138)		76,759
DOE (5-27118)		135,000
Utah Power & Light		90,000
EG & G Idaho, Inc.		39,937
NSF (5-22205)		130,000
Univ. of Kentucky		12,194
Brigham Young University		75,160
CPS Corporation		<u>15,000</u>
	<b>TOTAL</b>	<b>\$789,832</b>

Companies Associated Since Contract

In-State Associations  
Brigham Young University  
Utah Power & Light

Out-of-State Associations  
Department of Energy  
National Science Foundation  
CPS Corporation  
IG & G Idaho Inc.

Center for Advanced Coal Technology Contract #87-1078

<u>Payments:</u>	<u>Amount</u>	<u>Balance</u>
02 Feb 88	\$12,500	\$137,500

Total Payments: \$12,500

CENTER FOR MATERIALS AND CONTRACT AMOUNT: \$166.900  
MANUFACTURING

Joel DuBow, University of Utah

<u>Matching Funds:</u>	<u>In-Kind</u>	<u>Cash</u>
<u>Source</u>		
DuPont		\$ 65,000
American Chemical Society		3,809
Westinghouse		37,474
DOE Chicago Operations		84,971
GeoCenter		<u>40,000</u>
	TOTAL:	\$241,254

Associations Since Contract (5)

DuPont  
American Chemical Society  
Westinghouse  
DOE Chicago Operations  
GeoCenter

In-State Associations

Out-of-State Associations

DuPont  
American Chemical Society  
Westinghouse  
DOE Chicago Operations  
GeoCenter

Center for Materials & Manufacturing Contract #88-2414

(No Payments to Date)

CENTER FOR BASE EDUCATION                      CONTRACT AMOUNT: \$ 85,000  
TECHNOLOGIES  
Carol Weller, University of Utah

<u>Matching Funds:</u>	<u>In-Kind</u>	<u>Cash</u>
<u>Source</u>		
Federal Grants		\$ 160,807

Companies Associated Since Contract (3)  
National Assessment Institute  
Microsoft  
Megawest Systems

In-State Associations  
Beehive International  
DEC Diasonics  
Chris O'Neill  
Mesa  
Salt Lake Community High School  
WICAT  
Sculptured Software  
Wasatch Educational Systems

Out-of-State Associations  
National Assessment Institute  
Megawest Systems  
Microsoft

Center for Base-Technical Education Contract #88-2412  
(No Payments to Date)

UTAH RESEARCH INSTITUTE      CONTRACT AMOUNT: \$300.000  
David Norton, Utah State University

The main focus is to establish a policy objective of improving the technology base for economic development in Utah. This Center furthers that objective by (a) encouraging interdisciplinary research in targeted areas; (b) strengthening the interaction and cooperation between university and industry; and (c) thereby accelerating the application and commercialization of university research.

<u>Matching Funds</u>	<u>In-Kind</u>	<u>Cash</u>
<u>Source:</u>		
(Consortium of Companies)		\$ 45.000
Rust Engineering		60.000
Marine Dynamics Biometrics		<u>54.000</u>
	TOTAL:	\$ 159.000

Companies Associated Since Contract (2)  
Rust Engineering  
Marine Dynamics Biometrics

In-State Associations

Out-of-State Associations  
Rust Engineering  
Marine Dynamics Biometrics

Utah Research Institute Contract #88-2102

<u>Payments</u>	<u>Amount</u>	<u>Balance</u>
19 Feb 1988	\$72,263.35	\$227,736.65

Total Payments: \$72,263.35